

# Measuring the Effect of Low Water Temperature on Blanking and Grain Yield

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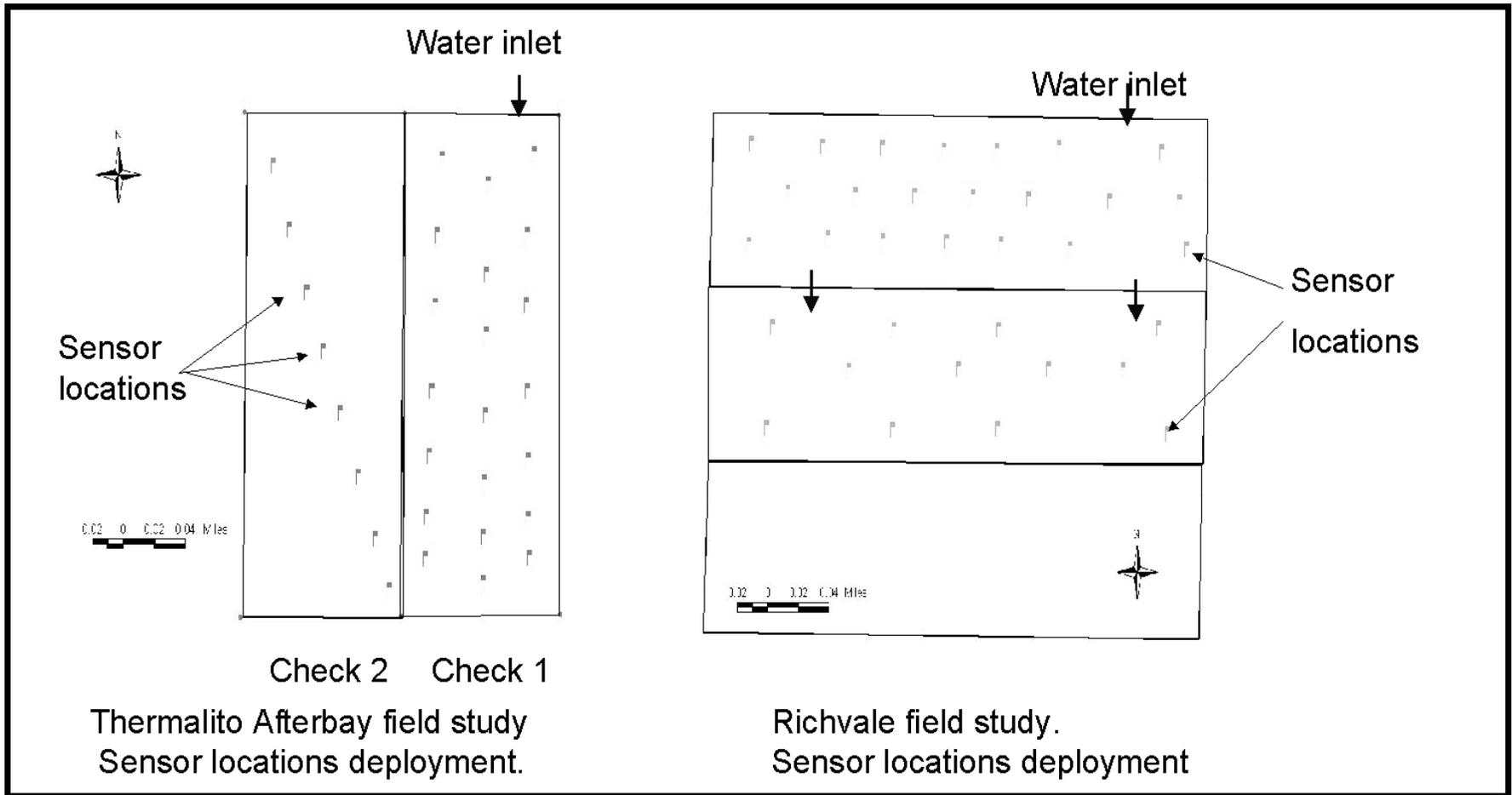
**University of California Cooperative Extension**



# *Objectives*

- At the field scale
  - ✓ *Quantify the effect of low water temperature on yield*
  - ✓ *Determine spatial extent of low temperature effects*
- At the regional scale
  - ✓ *Monitor water temperature throughout the irrigation district along the canal*
  - ✓ *Determine whether water temperature can be estimated by remote sensing*

# Locations of sensors within fields

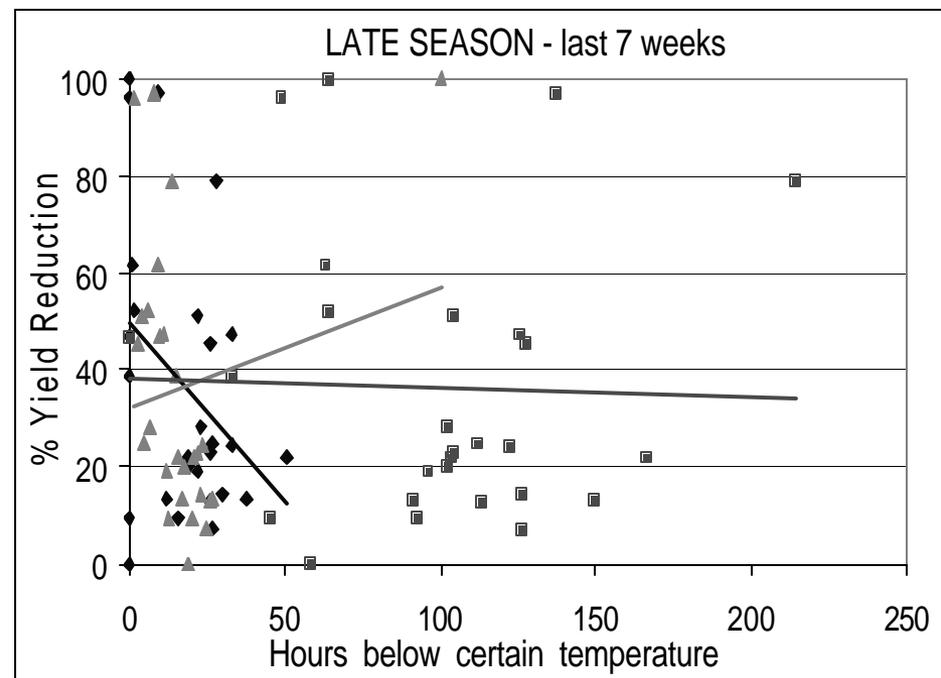
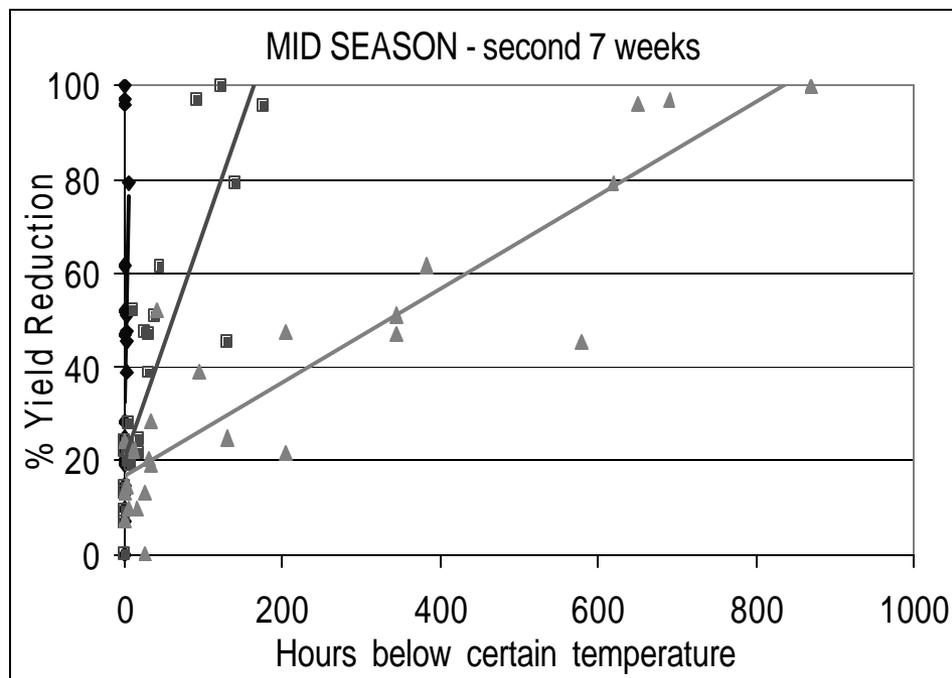
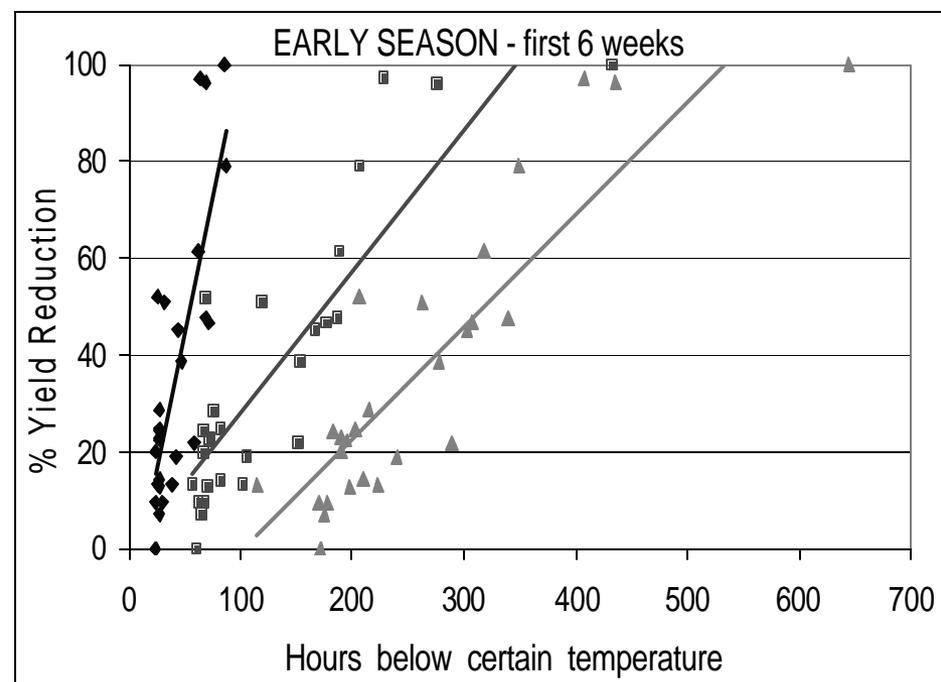
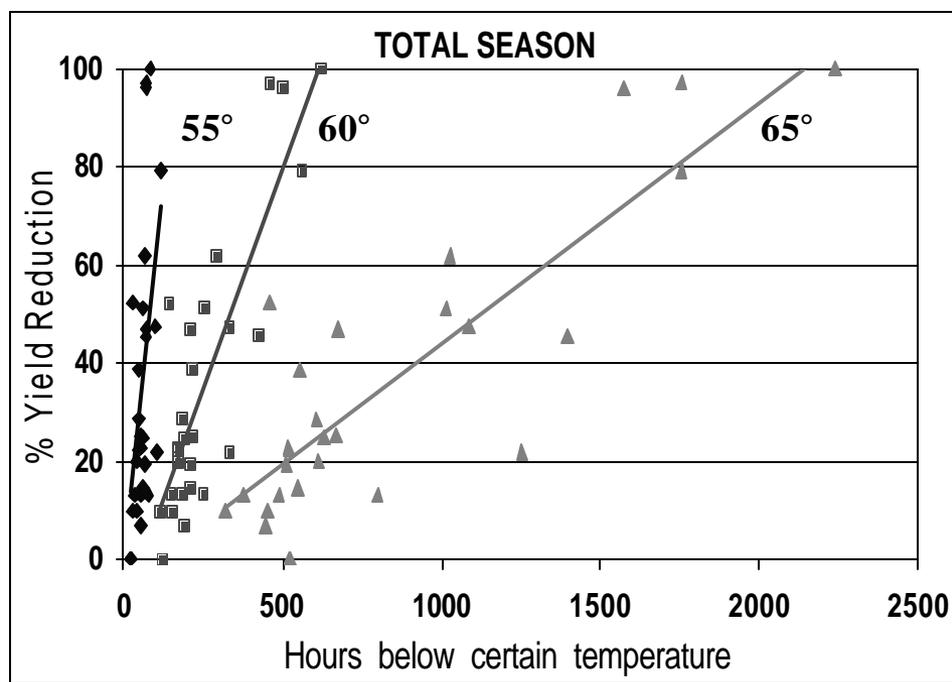


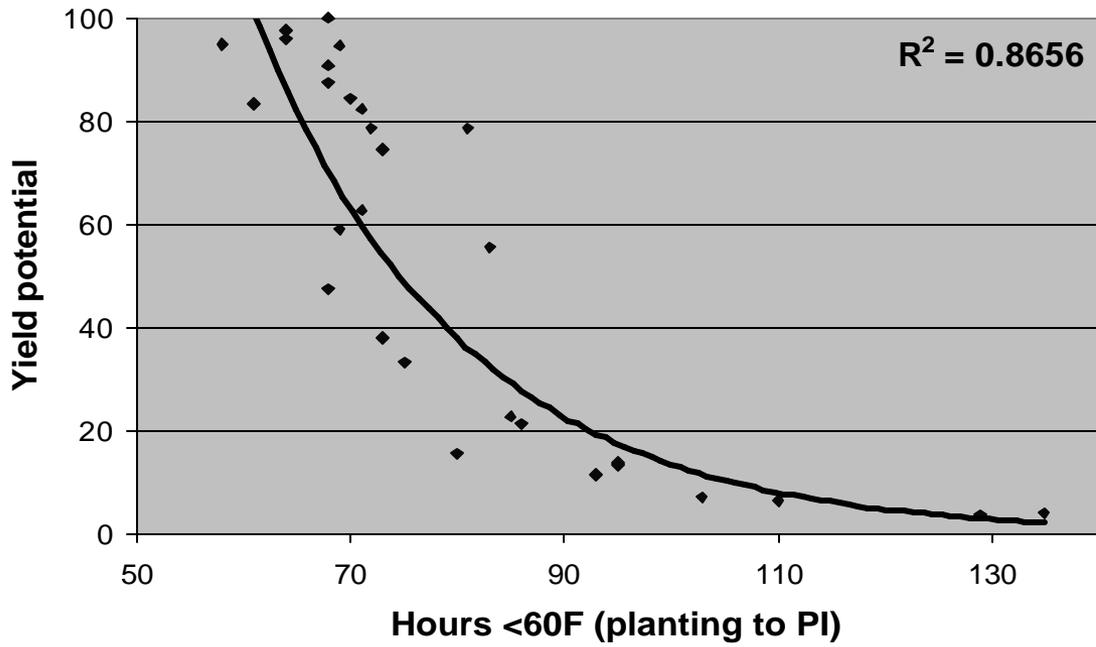
Check 2 Check 1

Thermalito Afterbay field study  
Sensor locations deployment.

Richvale field study.  
Sensor locations deployment

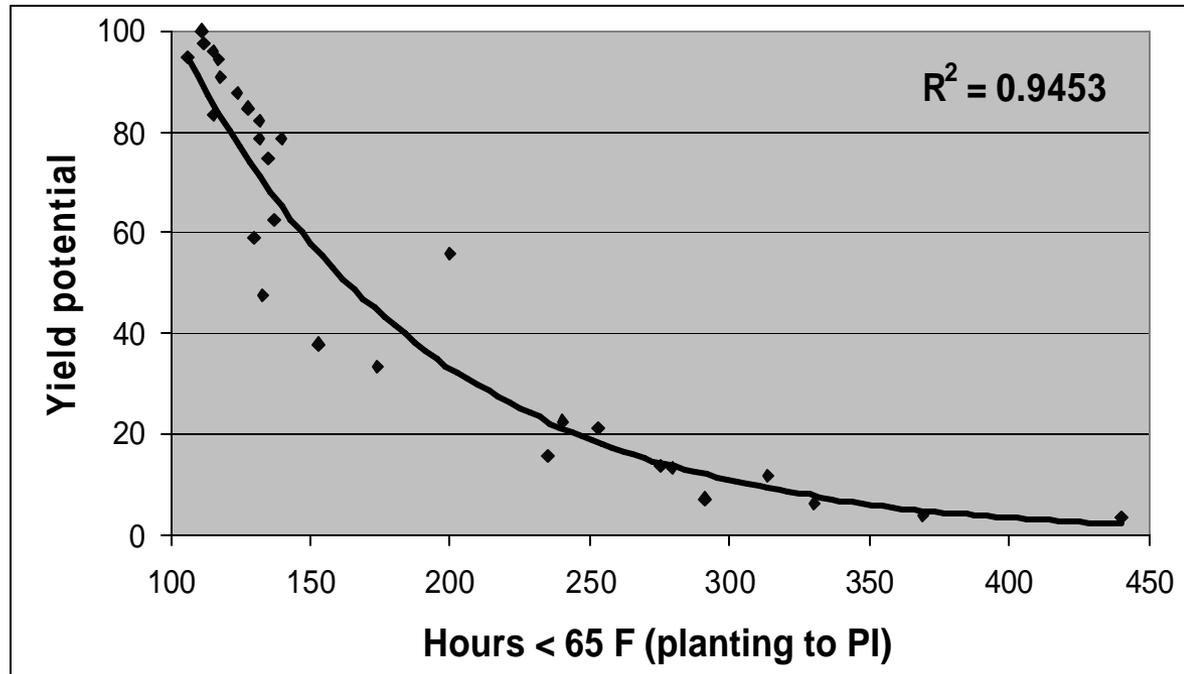




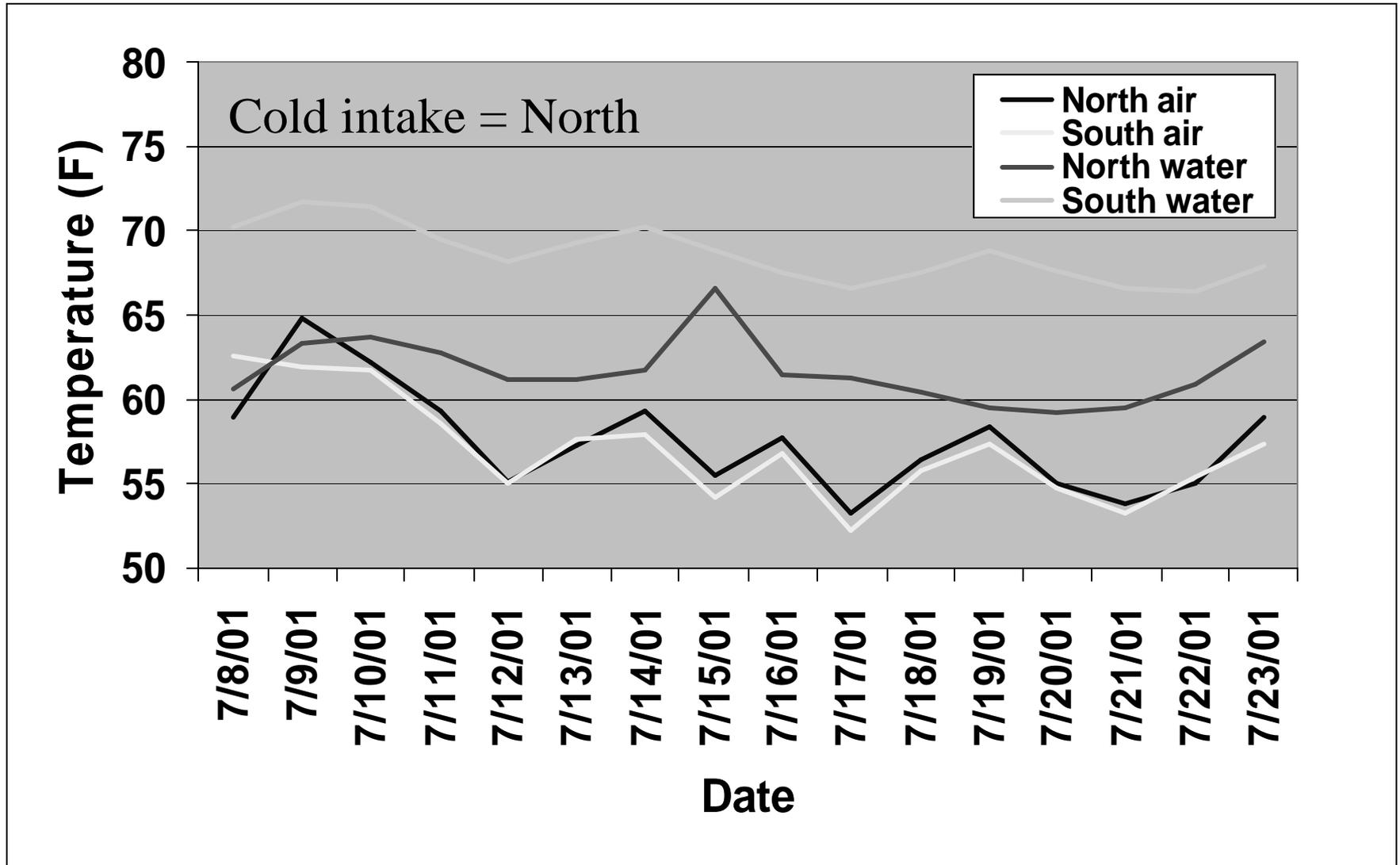


**Effect of exposure time to cold water on yield potential - 2002 data.**

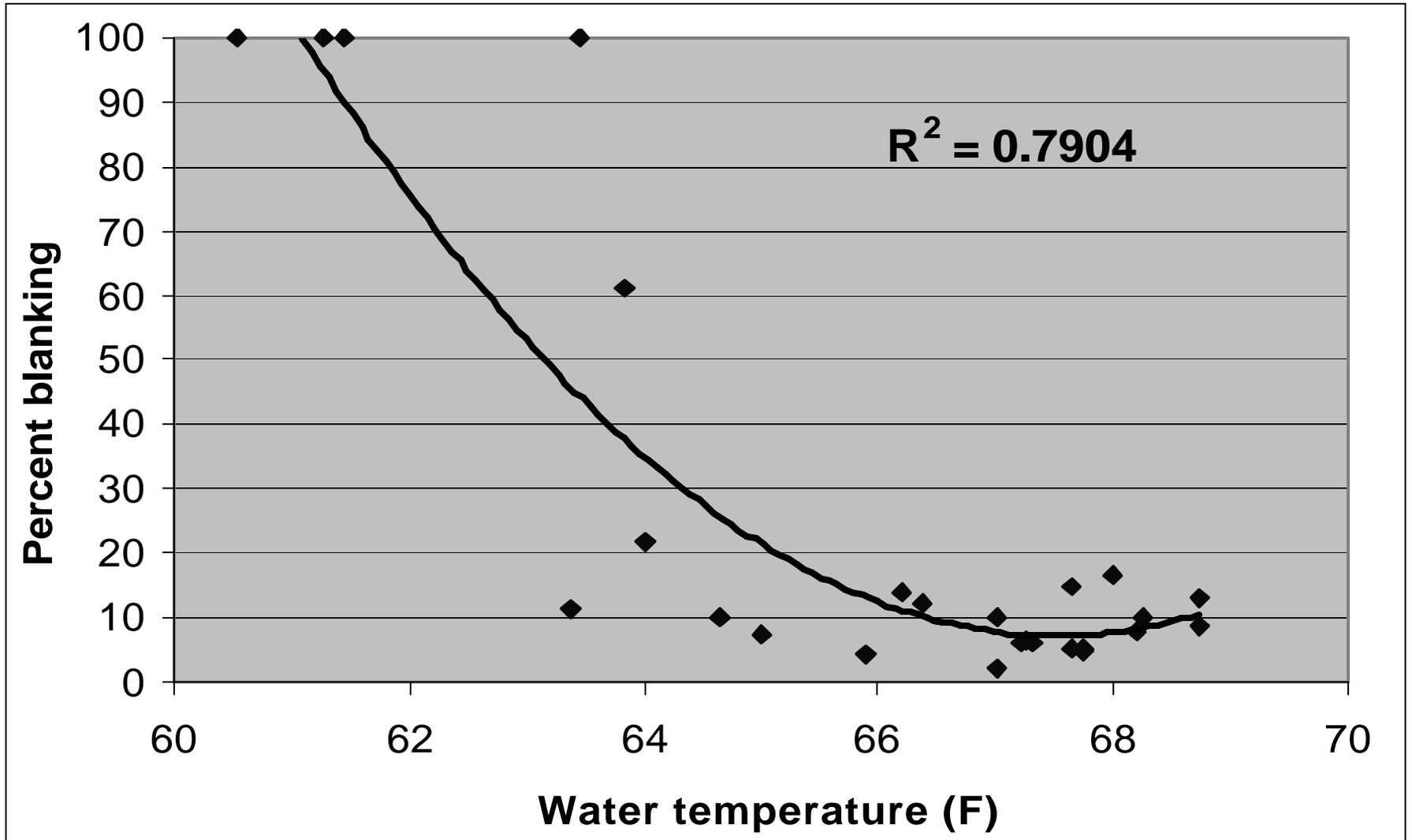
**8 AM - 4 PM PDT**



# Minimum air and water temperatures during pollen meiosis



# Water temperature vs. blanking





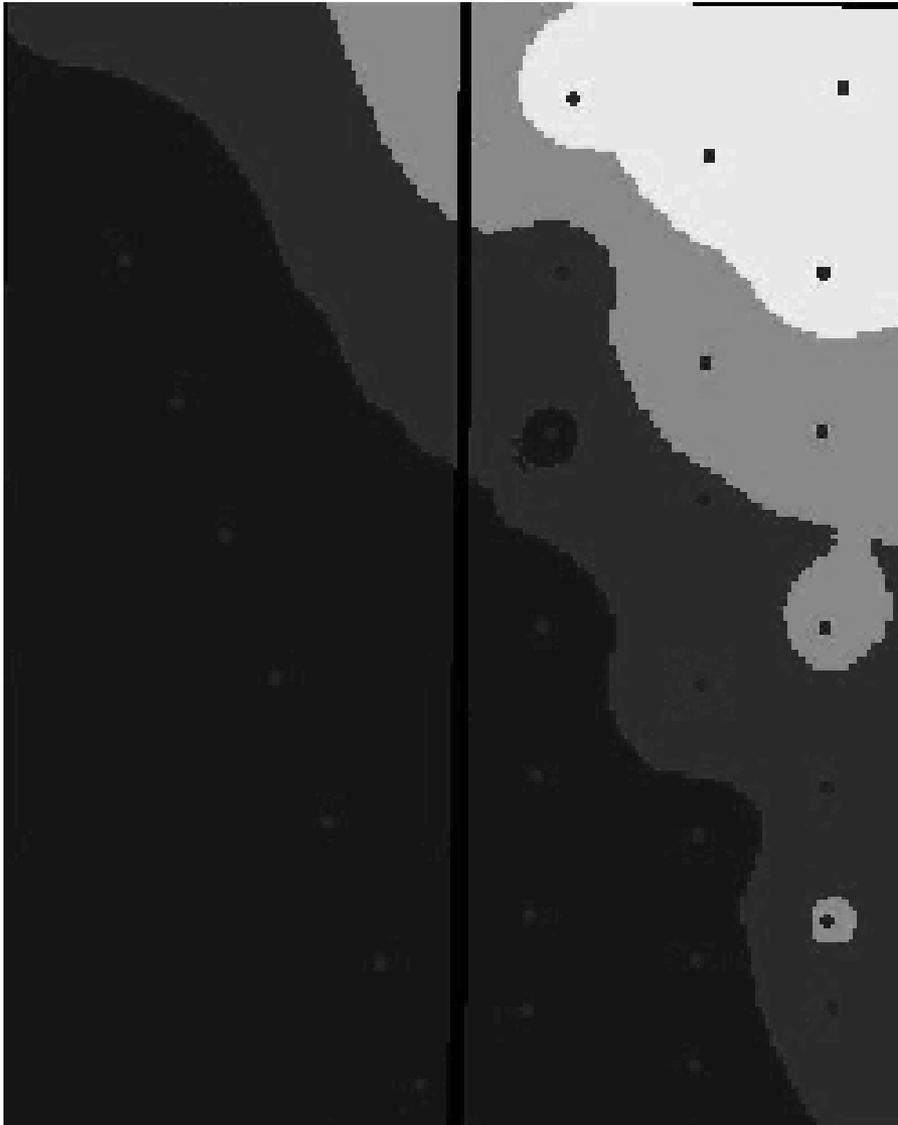
# Days after planting (DAP) to reach different growth stages: Site 1 - 2002.

	1st tiller	PI	Boot	50% head
	----- DAP -----			
North	43	85	120	---
(inlet)	34	69	104	114
	31	64	90	104
South	32	64	88	96

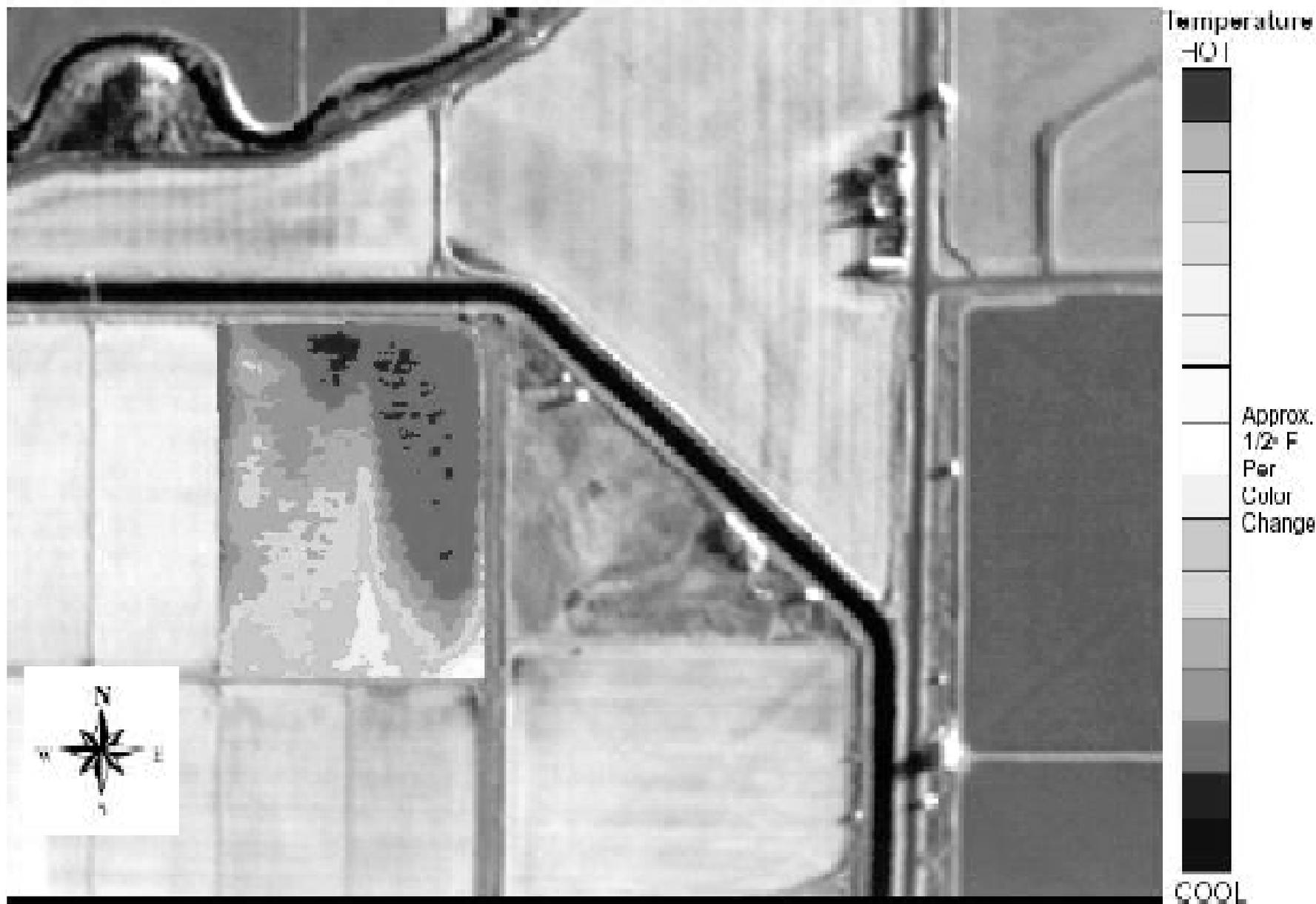
## Yield components at probe locations in the center of field: Site 1 - 2002.

	Head (cm)	Seeds per panicle	% blanks	Yield (lb) @ 14% MC
North	14	0	98	402 (green)
(inlet)	13	10	53	2288
	16	48	29	5924
South	17	53	12	9138

# Paddy Yield (lb/acre)



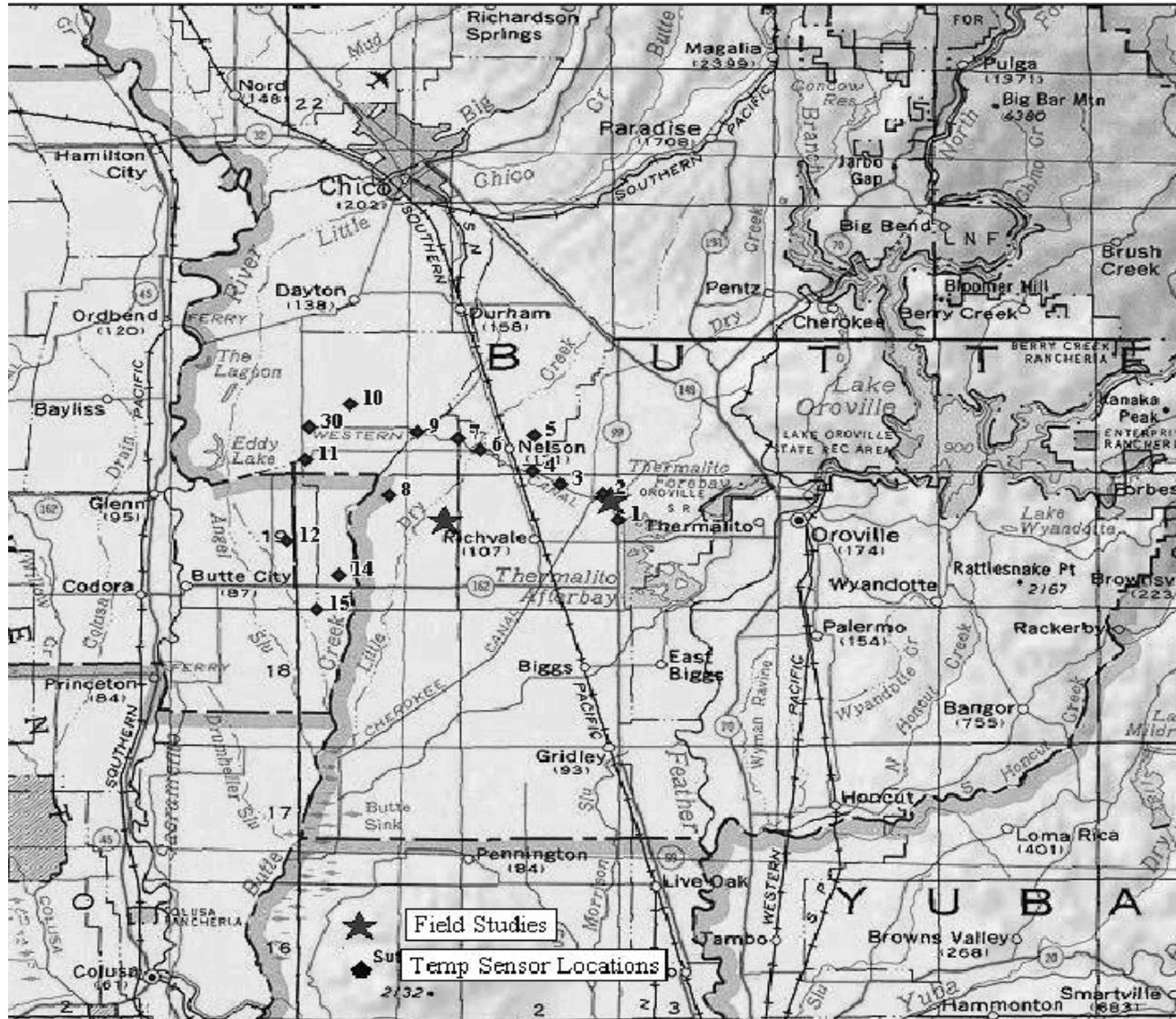
# Remotely sensed thermal image



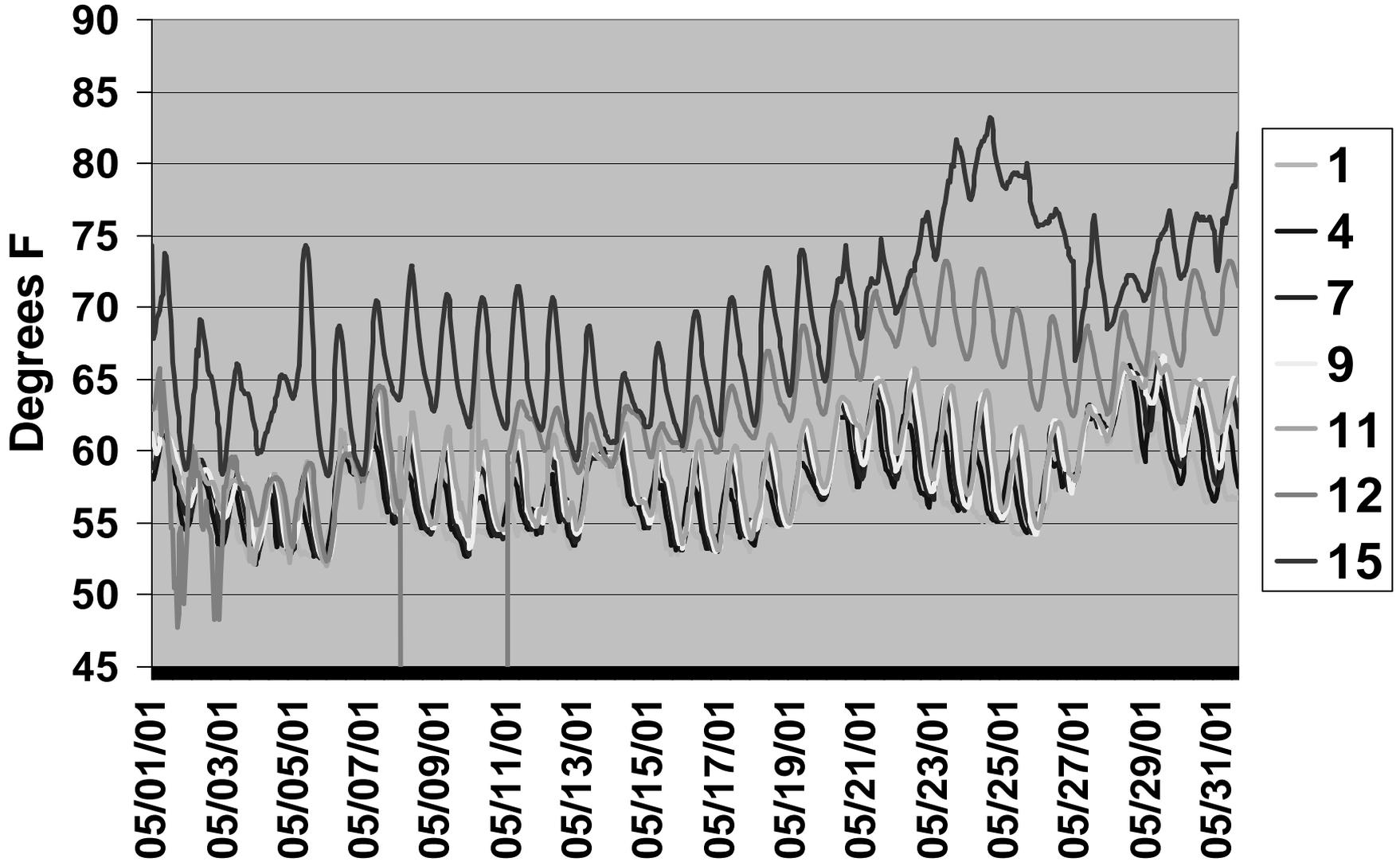
# Temperature measurements along Irrigation District Main Canal



# Sensor locations

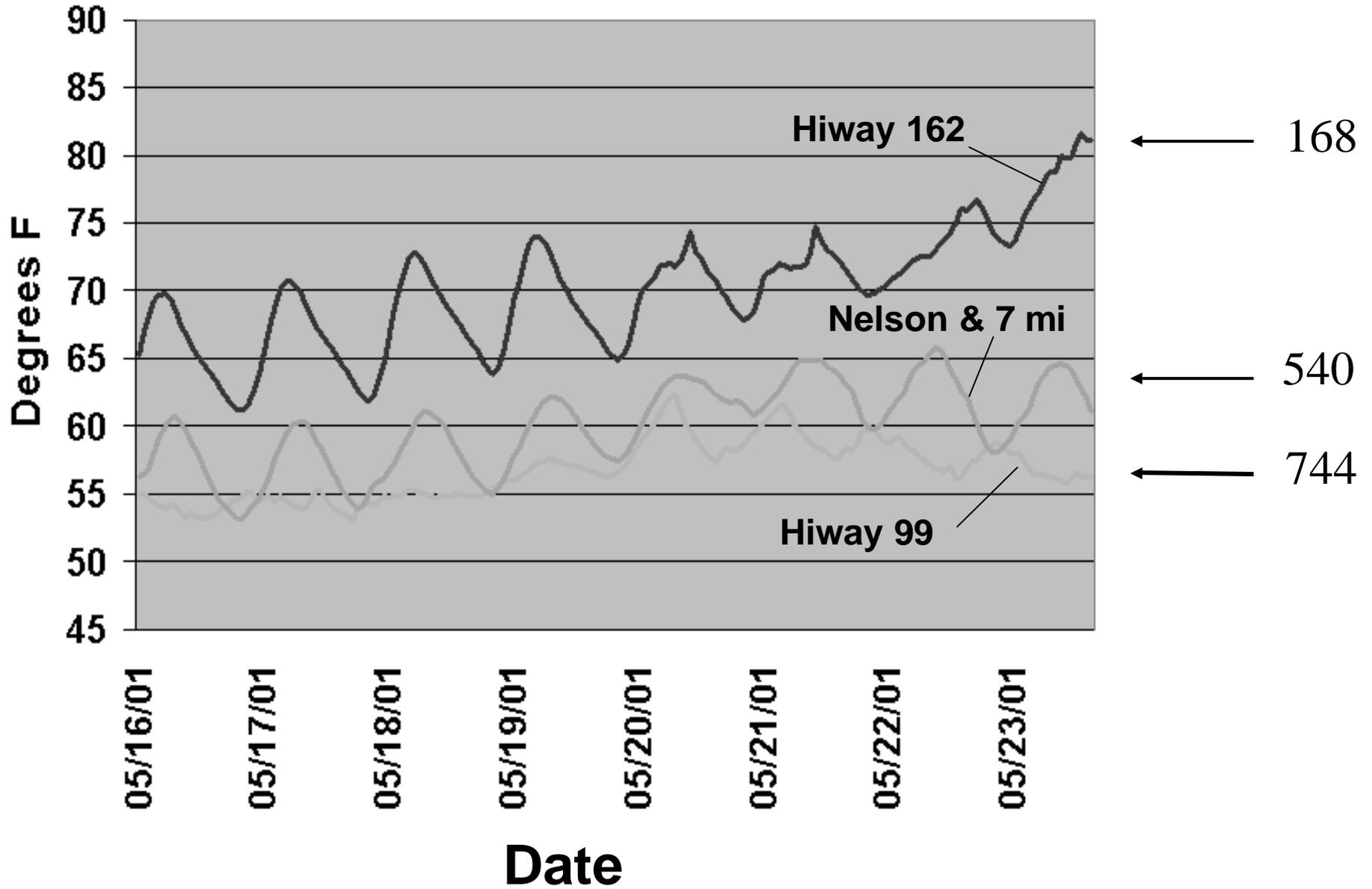


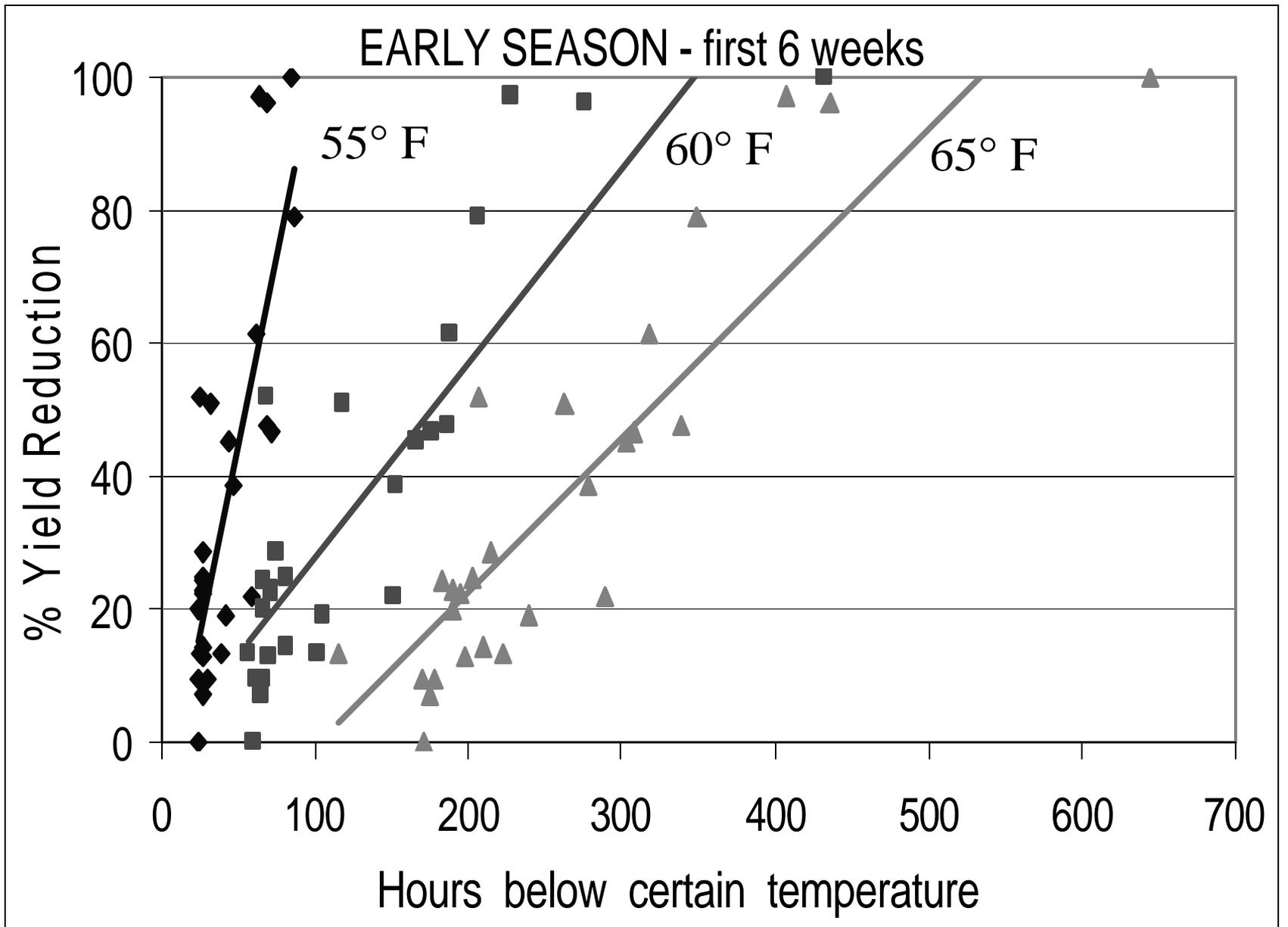
# Western Canal May 2001





Hours < 65 F  
(month)



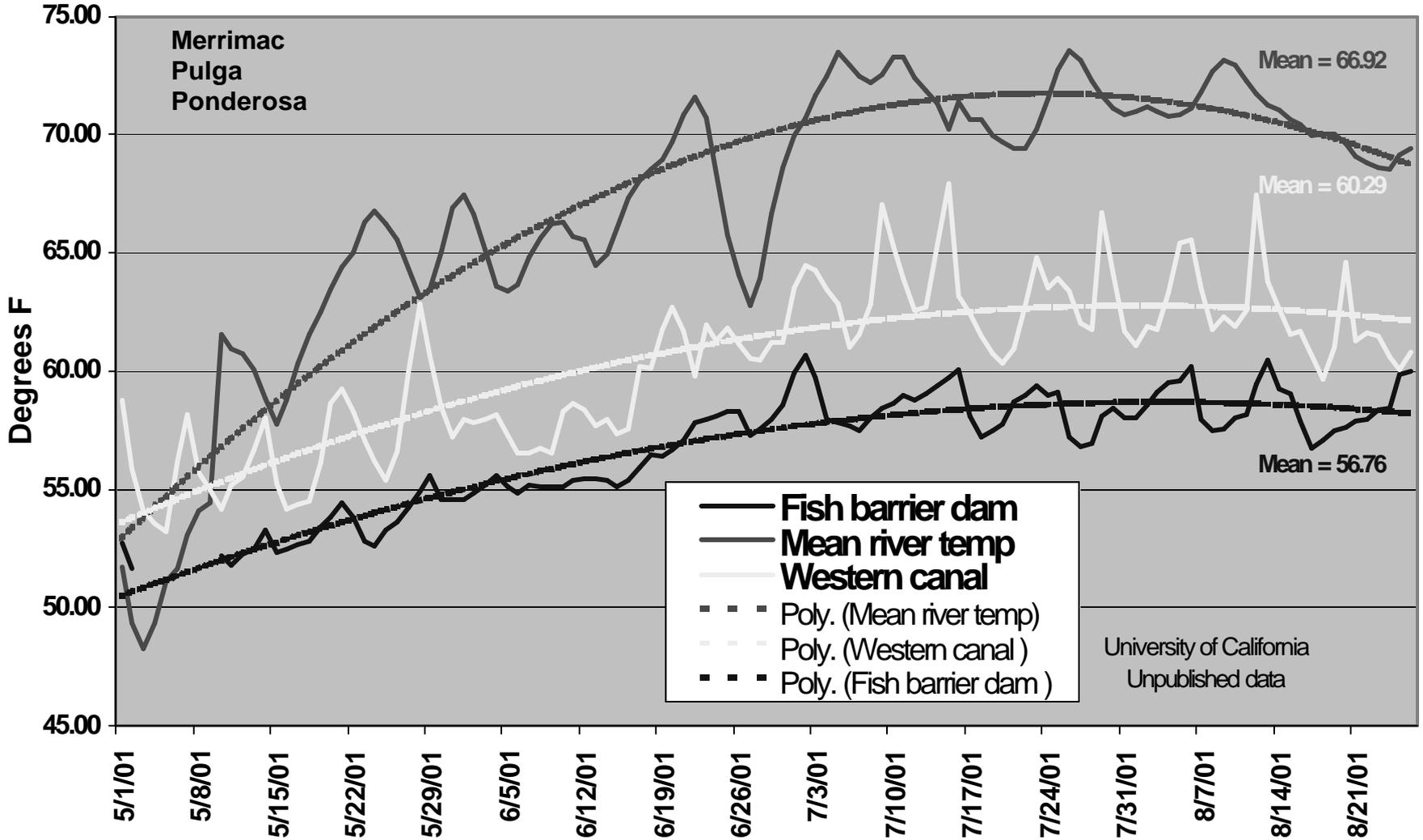


# *Western Canal Average Temperatures*

	Planting			PI			Grain fill		
Probe #	Min	Max	Ave.	Min	Max	Ave.	Min	Max	Ave.
1	54	58	56	62	66	64	60	63	62
4	54	59	56	62	68	65	60	65	63
9	55	61	58	62	69	66	61	67	64
11	55	63	58	66	70	68	65	68	67
15	61	71	65	70	79	74	68	74	71

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# Feather River-Western Canal Water Temperatures 2001



# Average July water temperatures of Feather River at Oroville

Years	MAX	MIN
1963-1967	69.4	68.2
1970-1975	60.9	59.0
1996-2001	61.0	57.0

# ***Conclusions***

- Mid-season threshold water temperature between 60° F and 65° F.
- Yield loss due to low water temperatures can occur even at non blanking air temperatures.
- Remotely sensed images related well to spatial yield variability.
- Regional impact of lower water temperatures is wide spread.

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